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EXAMINER

SCHWARTZ, JORDAN MARC

ART UNIT PAPER NUMBER

2873

DATE MAILED: 05/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/784,021

Applicant(s)

TERASAWA ET AL.

Examiner

Jordan M. Schwartz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2002.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 9-46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,9-12,14,15,17-26,28,29 and 31-46 is/are rejected.
- 7) ☒ Claim(s) 13,16,27 and 30 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claims 23 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In reference to claim 23, applicant is claiming that the first optical system has a lens group of positive optical power "disposed closest to the object side" and it is not clear what it is closest relative to thereby rendering the claim vague and indefinite. Specifically, it is not clear if applicant is claiming that this claimed lens group of positive optical power is the most object side lens group of the projection optical system (the assumed meaning), is the most object side lens group of the first imaging optical system, or if some other meaning is intended and the lack of clarity renders the claim vague and indefinite. As a suggestion, applicant may want to claim "and disposed closest to the object side of said projection optical system" if this is the intended meaning as is assumed.

Claim Objections

Claim 40 (and its respective dependent claims 41-46) is objected to for the following reason. Since the intended meaning could be determined from the specification and the Figures, a 112 rejection was not made but instead this lack of clarity issue is being raised in the following claim objection.

With respect to claim 40, that part of the claim stating "wherein light emitted from said three lenses" which creates a lack of clarity since none of the lenses are emitting

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light. The assumed meaning from what is set forth in the specification and Figures is "wherein light that has passed through said three lenses is directed to said imaging optical system".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 9-12, 14-15, 17-26, 28-29 31-32, 34-35 and 37-39 are rejected under 35 U.S.C. 102(e) as being anticipated by Shafer et al publication number 2001/0043391 (hereinafter referred to as "Shafer'391").

Shafer'391 discloses the limitations therein including the following: see Figures 2-4 and the corresponding first, second and third embodiments. Reference below is made to the Figure 2 embodiment but the corresponding similar lens or mirror in the Figure 3 or Figure 4 embodiments is also applicable. Shafer'391 discloses a projection optical system for projecting an image of an object onto an image plane (abstract) comprising a first image optical system for forming an image of the object (Figure 2, "L21 to "Imi"); the first imaging optical system including a first mirror for reflecting and collecting abaxial

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light from the object (Figure 2, "M21"); the first imaging optical system further including a lens of positive refractive power (Figure 2, "L21"); a second imaging optical system for re-imaging the image upon the image plane (Figure 2, either "M23" to "Im" or "L24" to "Im" or "L26" to "Im"); a second mirror for reflecting light from the first mirror to the image plane side (Figure 2, "M22"); whereby the abaxial light is caused to pass outside of an effective diameter of the first mirror (Figure 2 re outside of the effective diameter of "M21"); a lens group of negative refractive power disposed between the first and second mirrors and between the first mirror and the refractive lens (Figure 2 either or both of elements "L22" and "L23" as the "lens group of negative refractive power" and both are between first mirror "M21" and second mirror "M22" as well as between first mirror "M21" and the refractive lens "L21").

Shafer'391 further discloses a field optical system between the first and second imaging optical system (Figure 2, either "M23" to "M24" as the field optical system or "M23" to L25" as the field optical system); for projecting a pupil of the first imaging optical system onto the second imaging optical system (Figure 2); the first imaging optical system comprising a first mirror group of positive refractive power including the first mirror (Figures 2 and the first or second embodiments re mirror "M21" or "M31"); the first imaging optical system including a second mirror group including the second mirror (Figures 2 re mirror "M22"); the second imaging optical system constituted by lenses only and having a positive power (Figure 2 with the second imaging optical system as "L26" to "Im"); the field optical system comprising a first field mirror group having a first field mirror (Figure 2, "M23"); and a second field mirror group including a

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second field mirror (Figure 2, "M24") the light traveling as set forth in claim 14 (see Figure 2); the first field mirror comprising a concave mirror (Figure 2, "M23"); the second field mirror comprising a convex mirror (Figure 2, "M24"). Shafer further discloses satisfaction of the conditions of claims 11-12, 18-22 and 28 (see first and second embodiments and corresponding tables). Shafer'391 further discloses the first imaging optical system having a lens group having a positive refractive power and disposed closest to the object side of the projection optical system (Figure 2 re element "L21"); the first mirror group including a lens of negative refractive power and said first mirror (Figure 2 with "L22" as the claimed "lens group having negative refractive power" of claim 1 and "L23" and "M21" as the "first mirror group"); the second mirror group including the second mirror and a lens (Figure 2 with "L23" as the claimed "lens group having negative refractive power" of claim 1 and element "L22" and "M22" as the "second mirror group"); abaxial light from the object passing through a lens of the second mirror group before being incident on the first mirror group (Figure 2 with the abaxial light first passing through lens "L22" before being incident on mirror "M21"); the second field mirror group including a second field mirror and a lens (Figure 2 with the first field mirror group being "M23" and the second field mirror group being "M24 to L25"); the system as both sided telecentric (Paragraph 0023); the projection optical system has a reduction magnification (abstract); a stop within the second imaging optical system (Figure 4 embodiment); the second imaging optical system including two mirrors (Figure 2 with the second imaging optical system as "M23 to "Im"); the first and second mirrors adjoin along a common path (Figure 2); the apparatus for printing a

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pattern of a mask onto a substrate (paragraphs 0061 and 0069); and printing a device pattern onto a wafer by exposure (paragraph 0069). The projection system of Shafer'391" will inherently satisfy the conditions of claims 2 and 17, this being reasonably based upon the similarity in structure and function of the projection system of Shafer'391 and that of the claimed invention.

Claims 40-44 and 46 are rejected under 35 U.S.C. 102(b) as being anticipated by Shafer patent number 4,747,678 (hereinafter referred to as "Shafer'678").

Shafer'678 discloses the limitations therein including the following: a projection optical system for projecting an image of an object onto an image plane (column 1, lines 6-11) comprising a first image optical system for forming an image of the object (Figure 3, element "30" through "li"); the first imaging optical system including a first mirror for reflecting and collecting abaxial light from the object (Figure 3, "44"); a second imaging optical system for re-imaging the image upon the image plane (Figure 3, either "54" to "66" or "58" to "66"); a second mirror for reflecting light from the first mirror to the image plane side (Figure 3, "46"); whereby the abaxial light is caused to pass outside of an effective diameter of the first mirror (Figure 3 re outside of the effective diameter of "44"); a field optical system including three lenses of positive power (Figure 3 elements "72", "74" and "78" and similar to what applicant discloses such as in applicants Figures 12-14 or 18, the field lenses can be either before or after the formation of the intermediate image); the abaxial light having passed through the outside of the effective diameter of the first mirror is refracted by the three lenses toward a direction nearing the optical axis (Figure 3 with the light after having passed through the three positive lenses

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is closer to the optical axis); and the light having passed through the three lenses is directed to the second imaging optical system (Figure 3).

Shafer'678 further discloses the field optical system including a negative lens (Figure 3, element "76"); the second imaging optical system including two mirrors (Figure 3 with the second imaging optical system as "54" through "66"); and the first and second mirrors adjoining along an optical path (Figure 3); the apparatus for printing a pattern of a mask onto a substrate (column 2, line 43); and printing a device pattern onto a wafer by exposure (column 2, line 43).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shafer'391 in view of Shafer'678.

In reference to claim 33, Shafer'391 discloses as is set forth above but does not specifically disclose a field stop located at the position of the intermediate image. Shafer'678 teaches that in a projection optical system for use in photolithography (column 5, lines 6-11) having a first imaging system that produces an intermediate image and a second imaging system that forms a final image on the imaging plane (Figure 2) that it is desirable to place a field stop at the location of the intermediate image in order to prevent scattered light at the image (column 2, line 66 to column 3,

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line 5). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the microlithographic projection system of Shafer'391 as including a field stop located at the intermediate image since Shafer'678 teaches that in a projection optical system for use in photolithography having a first imaging system that produces an intermediate image and a second imaging system that forms a final image on the imaging plane that it is desirable to place a field stop at the location of the intermediate image in order to prevent scattered light at the image. Furthermore, having a field stop located at the intermediate image would inherently change at least one of a size and shape of the imaging region, this being reasonably based upon the similarity in structure and the specified location of the field stop to that of the claimed invention.

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shafer'391.

Shafer'391 discloses as is set forth above but does not specifically disclose the use of and ArF excimer laser or and F2 excimer laser. However, Shafer'391 discloses the use of an excimer laser (0013) and the projection system being used for either EUV or DUV or VUV microlithography ((paragraphs 0005 and 0056). The examiner takes Judicial Notice that it is well known in the art of microlithography to use either an ArF or F2 excimer laser in order to provide the required exposure in ultraviolet photolithography. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the photolithography projection apparatus of Shafer'391 as including either and ArF or F2 excimer laser since

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Shafer'391 discloses the use of an excimer laser with the system being used for ultraviolet microlithography and since it is well known in the art of microlithography to use either an ArF or F2 excimer laser to provide the required exposure in ultraviolet photolithography.

Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shafer'678.

Shafer'678 discloses as is set forth above but does not specifically disclose the use of and ArF excimer laser or and F2 excimer laser. However, Shafer'678 discloses the projection system being used ultraviolet microlithography (column 1, lines 6-11 and column 2, line 35). The examiner takes Judicial Notice that it is well known in the art of microlithography to use either an ArF or F2 excimer laser in order to provide the required exposure in ultraviolet photolithography. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the photolithography projection apparatus of Shafer'678 as including either and ArF or F2 excimer laser since Shafer'678 discloses the use the system being used for ultraviolet microlithography and since it is well known in the art of microlithography to use either an ArF or F2 excimer laser to provide the required exposure in ultraviolet photolithography.

Allowable Subject Matter

Claims 13, 16, 27, and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With respect to the allowable subject matter, none of the prior art either alone or in combination disclose or teach the claimed combination of limitations. Specifically, with reference to claim 13, none of the prior art either alone or in combination disclose or teach of the claimed projection optical system having the specific claimed structure of independent claim 1 and the field optical system having the specific claimed structure of claim 9, the light traveling as set forth in claims 1 and 9, and specifically further wherein the field optical system is all constituted by lenses. Specifically, with reference to claim 16, none of the prior art either alone or in combination disclose or teach of the claimed projection optical system having the specific claimed structure of independent claim 1 and the field optical system having the specific claimed structure of claims 9 and 14, the light traveling specifically as set forth in claims 1, 9 and 14, and specifically further with the first and second field mirrors each comprising a concave mirror. Specifically, with reference to claim 27, none of the prior art either alone or in combination disclose or teach of the claimed projection optical system having the specific claimed structure of independent claim 1 and the field optical system having the specific claimed structure of claim 9, the light traveling as set forth in claims 1 and 9, and specifically further wherein a positive lens is included by the field optical system and is disposed just after the image plane side of the first mirror group of the first imaging optical system. Specifically, with reference to claim 30, none of the prior art either alone or in combination disclose or teach of the claimed projection optical system having the specific claimed structure of independent claim 1 and the field optical system having the specific claimed structure of claims 9 and 14, the light traveling specifically as set forth in claims 1, 9 and 14, and

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specifically further with a positive lens included in the field optical system disposed between the first mirror of the first imaging optical system and the second field mirror of the field optical system with light reflected by the second mirror passing through the positive lens and then being reflected by the first field mirror.

Response to Arguments

Applicant's arguments with respect to the above rejected claims have been considered but are moot in view of the new ground(s) of rejection set forth above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jordan M. Schwartz whose telephone number is (703)

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308-1286. The examiner can normally be reached on Monday to Friday (8:00-5:30), alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached at (703) 308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A handwritten signature in black ink, appearing to read 'J. Schwartz', with a large loop at the end.

Jordan M. Schwartz
Primary Examiner
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May 8, 2003